

CLAIMS

[1] A device for removing lead sulfate, wherein:

using a positive voltage E (v) of a lead-acid battery as a reference, spike-shaped voltage pulses pointing in a negative direction from the positive voltage E (v) are applied between a positive electrode and a negative electrode of the lead-acid battery, to thereby pulverize non-conducting crystals -hereinafter referred to as lead sulfate (PbSO_4)- largely built up on the electrode surfaces of the lead-acid battery, gradually, starting from a point where the crystals on the projecting crystal surfaces are spaced apart from each other by the smallest distance between the positive and negative electrodes, thus returning the pulverized lead sulfate (PbSO_4) crystals to dilute sulfuric acid, followed by charging the battery to thereby dissociate the pulverized lead sulfate (PbSO_4) crystals into Pb^+ and SO_4^- in the dilute sulfuric acid, which return to the respective electrodes to thereby recondition the lead-acid battery.

[2] A device for removing lead sulfate according to claim 1, wherein:

a very thin penetration depth due to a skin effect caused by applying, between the positive and negative electrodes of the lead-acid battery, a current generated by the spike-shaped voltage pulses of duration (T_b) of 1 μs or less pointing in the negative direction from the positive voltage E (v) enables only crystal surfaces of the lead sulfate to be pulverized, thereby reconditioning the lead-

acid battery without damage to the electrode surfaces.

[3] A device for removing lead sulfate according to claim 1, wherein:

a frequency of the spike-shaped voltage pulses
5 pointing in the negative direction from the positive
voltage E (v) is adjusted in a range of 1 kHz to 100 kHz
according to conditions of the electrodes of the lead-acid
battery, to thereby obtain an optimal value of frequency,
which is applied between the positive and negative
10 electrodes of the lead-acid battery, thereby reconditioning
the lead-acid battery.

[4] A device for removing sulfuric acid according to claim 1, wherein:

a low electric power is constantly consumed using the
15 lead-acid battery as a power source, to thereby prevent
deposition of lead sulfate on the electrodes of the lead-
acid battery.

[5] A device for removing lead sulfate according to
claim 1, comprising: a reverse connection protection
20 circuit; a voltage detection circuit; a reference-voltage
generating circuit; a voltage comparator circuit; an
operation/non-operation switching circuit; an oscillating
circuit; an amplifier circuit; a spike-shaped voltage pulse
generating circuit for generating spike-shaped voltage
25 pulses of a short duration (T_b) of 1 μ s or less; a wave
shaping circuit; and an operation indicator which is
operated only by pressing an operation check switch.